

*A Meaningful Internship: Come join the best and brightest minds in the world at one of the most innovative and creative multidisciplinary research institutions engaged in strategic science on behalf of U.S. national security. The work that we do at Los Alamos National Laboratory (LANL) matters to our country and the world.*

## **HPC Data Movement and Storage Team: Upcoming Student Project Opportunities (Handout I)**

### **Project                    Emerging Storage System(s) Evaluation** (Lead Mentor: Dominic Manno)

Storage systems are evolving as technology, such as flash, becomes economically viable. Vendors implementing cutting edge hardware solutions often approach LANL to help gain insight into how these systems could move into the real world (HPC applications). Work in this area includes potential modifications to filesystems, filesystem configuration/tuning, testing hardware, fixing bugs, finding bottlenecks anywhere in the stack in order to increase efficiency and make the storage system faster.

#### Preferred skills

- Interest in HPC and storage systems
- Comfortable with computer hardware
- Strong analytical skills
- Benchmarking experience
- Experience with linux and scripting (bash, csh, Python, etc.)
- Comfortable with C programming

### **Project                    File System(s) Feature and Toolset Evaluations** (Lead Mentor: Dominic Manno)

File systems evolve along with user requirements. New features are implemented to accommodate changing workloads and technology. LANL's storage team must evaluate new features and their impact on HPC applications. This work will explore file system features, modifications to current build procedures/processes, and impact to LANL's storage team metric collection tooling. Work in this area includes building source code (kernel included), configuring linux servers, configuring a basic distributed file system, benchmarking, experiment design, analysis of data, and scripting.

#### Preferred skills

- Knowledge of and interest in filesystems
- Experience with Linux and Command Line Interface
- Experience with code build systems and software
- Interest in HPC and storage systems at scale
- Benchmarking experience

### ***About the HPC Data Movement and Storage Team***

The High Performance Computing (HPC) Data Storage Team provides vanguard production support, research, and development for existing and future systems that feed and unleash

***Make a Difference** - At LANL, we're determined to harness science and imagination to make the world a better and safer place by solving complex problems others can't. In LANL's High Performance Computing Division, we are pushing the computing pendulum, designing the future, and empowering scientists across the national laboratory to make an impact. When you're in charge of making a difference, there's no limit to what you can do.*



*Questions? How to Apply?* → [HPCRecruits@lanl.gov](mailto:HPCRecruits@lanl.gov)

the power of the supercomputer. The Data Storage Team designs, builds and maintains some of the largest, fastest and most complex data movement and storage systems in the world, including systems supporting 100 Petabytes of capacity. We provide storage systems spanning the full range of tiers from the most resilient archival systems to the pinnacle of high-speed storage, including all-flash file systems and systems supplying bandwidth that exceeds a terabyte per second to some of the largest and fastest supercomputers in the world. Innovators and builders at heart, the Data Storage team seeks highly motivated, productive, inquisitive, and multi-talented candidates who are equally comfortable working independently as well as part of a team. Team member duties include: designing, building, and maintaining world-class data movement and storage systems; evaluating and testing new technology and solutions; system administration of HPC storage infrastructure in support of compute clusters; diagnosing, solving, and implementing solutions for various system operational problems; tuning file systems to increase performance and reliability of services; process automation.

### ***Where You Will Work***

Our diverse workforce enjoys a collegial work environment focused on creative problem solving, where everyone's opinions and ideas are valued. We are committed to work-life balance, as well as both personal and professional growth. We consider our creative and dedicated scientific professionals to be our greatest assets, and we take pride in cultivating their talents, supporting their efforts, and enabling their successes. We provide mentoring to help new staff build a solid technical and professional foundation, and to smoothly integrate into the culture of LANL.

Los Alamos, New Mexico enjoys excellent weather, clean air, and outstanding public schools. This is a safe, low-crime, family-oriented community with frequent concerts and events as well as quick travel to many top ski resorts, scenic hiking & biking trails, and mountain climbing. The short drive to work includes stunning views of rugged canyons and mesas as well as the Sangre de Cristo mountains. Many employees choose to live in the nearby state capital, Santa Fe, which is known for world-class restaurants, art galleries, and opera.

### ***About LANL***

Located in northern New Mexico, Los Alamos National Laboratory (LANL) is a multidisciplinary research institution engaged in strategic science on behalf of national security. LANL enhances national security by ensuring the safety and reliability of the U.S. nuclear stockpile, developing technologies to reduce threats from weapons of mass destruction, and solving problems related to energy, environment, infrastructure, health, and global security concerns.

The High Performance Computing (HPC) Division provides production high performance computing systems services to the Laboratory. HPC Division serves all Laboratory programs requiring a world-class high-performance computing capability to enable solutions to complex problems of strategic national interest. Our work starts with the early phases of acquisition, development, and production readiness of HPC platforms, and continues through the maintenance and operation of these systems and the facilities in which they are housed. HPC Division also manages the network, parallel file systems, storage, and visualization infrastructure associated with the HPC platforms. The Division directly supports the Laboratory's HPC user base and aids, at multiple levels, in the effective use of HPC resources to generate science. Additionally, we engage in research activities that we deem important to our mission.